

Description

This invention relates to a recording and/or reproducing apparatus for flexible magnetic disks, wherein a disk cassette consisting of a cassette and a flexible sheet-like magnetic disk, such as microfloppy disk, accommodated in the cassette, is chucked and the magnetic disk in the disk cassette is rotationally driven for writing or reading information signals to or from the magnetic disk.

Related Art Statement

Heretofore, in a recording and/or reproducing apparatus for flexible magnetic disks, in which a disk cassette such as micro-floppy disk, is attached or mounted and the information signals are written to or read from the magnetic disk contained in the cassette, there is provided an enclosed built-in disk attachment unit whereby the magnetic disk is chucked and secured to the disk table of the rotational driving device for the magnetic disk. The disk attachment unit is so designed that, as the disk cassette is introduced by way of the disk insertion and removal opening or aperture, the cassette holder is lowered for pressure holding of the disk cassette on the positioning pins while the magnetic disk is chucked on the disk table. The cassette holder of the disk attachment unit operating in the above described manner is mounted on top of a loading plate slidably disposed on top of the chassis and, as the loading plate is slid on the chassis, the cassette holder is moved vertically up and down with respect to the chassis. The magnetic disk is chucked and attached onto the disk table as described above when the cassette holder is lowered with respect to the chassis.

In operative association with the lowering of the cassette holder, a supporting arm of the head unit carrying a magnetic head or a disk supporting pad at the distal and thereof is rotated into abutment on the magnetic disk. The magnetic head or the disk supporting pad at the distal end of the thus rotated supporting arm and another magnetic head of the distal end of another supporting arm facing to the aforementioned supporting arm are brought into sliding contact with the magnetic disk while clamping the disk therebetween so as to enable information signals to be written to or read from the disk.

When the loading plate is slid for floating the cassette holder, the disk is unchucked from the disk table while the disk cassette is ejected towards the disk insertion or removal opening.

In the above described conventional disk attachment unit, when the loading plate is slid to lower the cassette holder onto the disk table for chucking the magnetic disk in the cassette onto the disk table of the rotational driving device for the

magnetic disk, the cassette holder is caused to descend horizontally onto the disk table. The supporting arm of the head device is also turned towards the magnetic disk in operative association with and nearly at the same time as the lowering of the cassette holder. The magnetic disk is clamped between the magnetic head or the disk supporting pad at the distal end of the supporting arm and the magnetic head at the distal end of the other supporting arm.

In the above described conventional disk attachment unit wherein the clamping of the magnetic disk by the head unit takes place almost concurrently as the lowering of the cassette holder holding the disk cassette, there is the risk that the magnetic disk be clamped by the head unit prior to complete engagement of the center opening in the metallic center core secured to the magnetic disk by the spindle of the rotational driving unit of the magnetic disk. As a result, chucking of the magnetic disk onto the disk table is occasionally insufficient so that it may be impossible to drive the magnetic disk into rotation.

In order to prevent occurrence of insufficient chucking as described above, it may be contemplated to get the magnetic disk chucked by the head unit after the cassette holder is lowered onto the disk table. Thus, it has been contemplated to provide rotation delay means whereby the supporting arm of the head unit is turned with a delay relative to the descent of the cassette holder. When the rotation delay device for the supporting arm is provided in this manner, the overall system is necessarily complicated, while the production costs are not lowered.

More specifically, an example of conventional systems is illustrated in document EP-A-0 144 068, which discloses a recording and/or reproducing apparatus for flexible magnetic disks, wherein a cartridge cradle is movable up and down relative to a base structure between a retracted position in which a magnetic disk cartridge is loaded and a working position in which the cartridge cradle holds the disk cartridge in engagement with a disk drive mechanism. A lower magnetic head is fixedly mounted on a carriage whereas an upper magnetic head is affixed to a head carrier which is mounted on the carriage via a cantilever spring. Normally holding the upper magnetic head in the retracted position, a head transport mechanism operates to move the upper magnetic head towards the lower magnetic head for the establishment of data transfer contact of both heads with the opposite faces of the magnetic disk when the cartridge cradle travels with the disk cartridge from the retracted position to the working position. This is reflected in the prior art portion of claim 1.

Summary of the Invention

It is therefore an object of the present invention to provide a recording and/or reproducing apparatus for flexible magnetic disks wherein the magnetic disk is clamped by the head unit after the disk within the cassette is chucked to the disk table of the rotational driving device for the magnetic disk, so as to enable positive chucking of the magnetic disk without complicating the overall system.

It is a further object of the present invention to provide a recording and/or reproducing apparatus wherein the magnetic head abuts on the magnetic disk at the time of attachment of the disk cassette only after the disk is chucked and wherein the magnetic heads are moved away from each other at the time of ejection of the disk cassette before the magnetic disk is unchucked so as to prevent injury to and provide a sufficient protection of the magnetic head.

For achieving these objects, the present invention provides a recording and/or reproducing apparatus as defined in claim 1.

Brief description of the Drawings

Fig. 1 is a side view showing the recording and/or reproducing apparatus according to the present invention.

Fig. 2 is an exploded perspective view thereof.

Fig. 3 is an overall perspective view thereof.

Fig. 4 is a diagrammatic side view showing the relation between the cam plates and the guide rolls.

Fig. 5 is a plan view showing the disk cassette being inserted into the recording and/or reproducing apparatus.

FIG. 6 is a plan view showing the disk cassette when attached or mounted in the recording and/or reproducing apparatus.

Fig. 7 is a side view of Fig. 5.

Fig. 8 is a side view of Fig. 6.

Fig. 9 is a perspective view of the disk cassette to be attached to the recording and/or reproducing apparatus.

Fig. 10 is a bottom view of the disk cassette.

Fig. 11 is a diagrammatic side view showing a modified embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Reference is now made to the accompanying drawings showing certain preferred embodiments of the present inventions.

A disk cassette to be attached to a recording and/or reproducing apparatus of the present invention will first be explained. Referring to Figs. 9 and

10, a sheet-like magnetic disk 3 is rotatably accommodated in a disk cassette 1 consisting of a halved cassette 2 comprised of an upper half 2a and a lower half 2b. A center core 4 formed by a metallic disk is securely attached to the center of the magnetic disk 3. A center opening 5 and a driving pin insertion opening 6 are provided at the center and at a position offset from the center of the center core 4, respectively. The center opening 5 is square while the driving pin insertion opening 6 is rectangular in configuration. The center core 4 is loosely fitted in a disk table insertion opening 7 provided at the center of the lower half 2b. A magnetic head insertion opening 8 provided to the upper and lower halves 2a, 2b along the radial direction of the magnetic disk 3 is adapted to be opened and closed by a shutter 9. In the flat surface of the lower half 2b of the halved cassette 2, positioning pin engaging apertures 10, 10 are formed on both sides of the shutter 9.

The recording and/or reproducing apparatus of the present invention is now explained, in which the disk cassette 1 constructed as described above is attached and which operates to rotationally drive the magnetic disk 3 accommodated in the disk cassette 1 while operating to write or read information signals to or from the magnetic disk 3.

As shown in Fig. 2, the apparatus has a rotational driving device 12 built into a chassis 11 and adapted for rotationally driving the magnetic disk 3 accommodated in the disk cassette 1. The rotational driving device 12 has a disk table 14 fitted and engaged by a spindle shaft 13 connected to an output shaft of a driving electric motor. On the disk table 14, a driving pin 15 biased to rotate is attached at a position offset from the spindle shaft 13, while a permanent magnet 16 is also attached for magnetically attracting and chucking the center core 4 of the magnetic disk 3. When the disk cassette 1 is attached to the disk table 14, the magnetic disk 3 is chucked, with the spindle shaft 13 engaging in the center opening 5 of the center core 4, the driving pin 15 engaging in the driving pin insertion opening 6 and with the center core 4 attracted by the permanent magnet 16. When the rotational driving device 12 is driven in this manner, the magnetic disk 3 is positioned on the disk table 14 and rotationally driven as one with the disk table 14.

On both sides of the chassis 11 to which there is attached the rotational driving device 12 constructed as described above, a pair of opposing side plates 17, 17 are attached, as shown in Fig. 2. Between these side plates 17, 17, a loading plate 18 is disposed so as to slide on the chassis 11. On top of the loading plate 18, a cassette holder 19 is disposed so as to provide a gap for insertion of the disk cassette 1.

These side plates 17, 17 are securely mounted to the chassis 11 by associated screws 20. To the inner sides of these side plates 17, 17, there are implanted slide guide pieces 24, 24 defining slide guide grooves 23, 23 in which are engaged guide rolls 22, 22 provided to projecting supporting shafts 21, 21 at rearward parts on both lateral sides of the cassette holder 19. These slide guide grooves 23, 23 are provided vertically with respect to the plane of the chassis 11. The loading plate 18 has four elongate apertures 25, one pair on each lateral side, in which are introduced four slide guide pins 26 implanted on the chassis 11, such that the loading plate 18 is mounted on the chassis 11 for sliding within the extent of these elongate apertures 25. At the center of the loading plate 18 is formed a cut-out or recess 27 opened towards the rear side so as to be confronted by the disk table 14. On both lateral sides of the loading plate 18, there are formed a forward pair of cam plates 32, 32 having curvilinear inclined cam surface 28, 28 and a rearward pair of cam plates 34, 34 having curvilinear inclined surfaces 30, 30. By virtue of these cam surfaces, the cassette holder 19 is supported in the floated position during the time the disk cassette 1 is ejected and during the time the cassette holder 19 is ready for receiving the disk cassette, while the cassette holder 19 is floated during the time the disk cassette 1 is held in the cassette holder under pressure as described hereafter in detail. The rearward pair of the cam plates 34, 34 are so designed that, as shown in the schematic views of Fig. 1 and 4, the height H_1 from the plane of the loading plate 18 to the horizontal portions 30a, 30a of the inclined cam surfaces 30, 30 thereof is higher than the height H_2 from the plane of the loading plate to the horizontal portions 28a, 28a of the inclined cam surfaces 28, 28 of the forward pair of the cam plates 32, 32. In addition, the radius of curvature R_1 of each of the inclined portions 30b, 30b of the inclined cam surfaces 30, 30 of the rearwardly positioned pair of the cam plates 34, 34 is selected to be larger than the radius of curvature R_2 of each of the inclined portions 28b, 28b of the inclined cam surfaces 28, 28 formed on the forward cam plates 32, 32.

Also the loading plate 18 is biased towards the forward side or along the arrow mark A in Fig. 3 by a tension spring 38 installed between an engaging portion 36 integral with the loading plate 18 and an engaging portion 37 integral with one of the side plates 17. To the forward side of the loading plate 18, there is integrally formed a button attachment portion 40 having an ejection button 39. To the lower rear surface of the loading plate 18 thus slidably mounted on the chassis 11 under the spring bias of the tension spring 38, there is mounted a depending locking pin 42 fitted with a roll 41.

When the loading plate 18 is in the eject position, the locking pin 42 is engaged with a locking lever 45 turnably supported on a supporting shaft 44 implanted on an attachment portion 43 integral with one of the side plates 17, for locking the loading plate 18 at the eject position against the action of the tension spring 38.

It is noted that the locking lever 45 is biased to rotate clockwise in Fig. 2 by a torsion coil spring 46. A projection 47 is implanted on the mid portion of the locking lever 45 so as to be thrust by one end of the disk cassette 1 during the process of the insertion thereof.

The cassette holder 19 is formed as a square flat plate of approximately the same size as the disk cassette 1. On both lateral sides of the cassette holder 19 are integrally formed slide guides 48, 48 having a U-shaped cross-section and adapted for supporting and guiding both lateral sides of the disk cassette 1 during the process of the insertion thereof. On both outer lateral sides of the cassette holder 19, there are provided a forward pair of guide rolls 50, 50 by means of supporting shafts 49, 49, besides the aforementioned rearward pair of the guide rolls 22, 22. These guide rolls 50, 50 are of the same diameter and provided at the same height in the direction of thickness of the cassette holder 19 as the rearward guide rolls 22, 22.

These rearward and forward guide rolls 22, 22; 50, 50 are so positioned that, when the cassette holder 19 is mounted on the loading plate 18, the guide rolls are in register with the cam plates 34, 34; 32, 32, respectively. On one lateral side of the cassette holder 19, a pair of small projections 51, 51 thrusting the disk cassette 1 are formed for extending towards the lower side of the cassette holder. On the front side of the cassette holder 19 is formed an inclined guide 52 adapted for guiding the disk cassette 1 during the process of insertion thereof. The cassette holder 19 is so mounted that the rear guide rolls 22, 22 are engaged in the slide guide slots 23, 23 of the slide pieces 24, 24 while the rear and forward guide rolls 22, 22; 50, 50 are caused to rest on the rear and forward cam plates 34, 34; 32, 32 of the loading plate 18, respectively. Since the rear cam plates 32, 32 on which rest the rear guide rolls 50, 50 are at a higher level than the forward cam plates 32, 32 on which rest the forward guide rolls 50, 50 the cassette holder 19 in the attachment position is tilted such that the rear or inner side thereof is at a higher level than the forward or inserting side of the disk cassette 1.

Between the cassette holder 19 thus placed on the loading plate 18 and the side plates 17, 17, there are provided a pair of compression springs 52, 52 for normally biasing the cassette holder 19 in the direction of the chassis 11. In opposition to

One of the rear cam plates 34 and to one of the forward cam plates 32 of the loading plate 18, guide pin extraction inhibit projections 53, 53 each being in the form of a letter U are formed on the loading plate 18 to inhibit extraction of the guide rolls 50, 22 of the cassette holder 19 placed on these cam plates 34, 32.

The space defined between the cassette holder 19 and the loading plate 18 is used for accommodating the disk cassette 1, while the forward side is formed as an insertion or removal opening 55 for the disk cassette 1.

On the cassette holder 19 attached to the loading plate 18 as described above, there is pivotally mounted an L-shaped shutter opening and closing lever 56 which is turned in a direction parallel to the plane of the disk cassette 1 attached thereto, that is, on the surface of the cassette holder 19, and which is adapted for opening and closing the shutter 9 of the disk cassette 1. The shutter opening and closing lever 56 has its proximate end pivotally mounted on a journal projection 57 implanted on the cassette holder 19. The lower surface of the distal end of the lever 56 is formed with a thrust pin 58 projecting beyond the lower surface of the cassette holder 19 so as to be engaged with a step 1a formed on the front side of the disk cassette 1 so as to abut on one side of the shutter 9. The lever 56 is biased to rotate counterclockwise as shown by an arrow mark C in Fig. 3 by a spring 59 installed between the cassette holder 19 and the shutter opening and closing lever 56. It will be noted that an arcuate guide wall 60 is formed on the cassette holder 19 along the trajectory along which the distal end of the shutter opening and closing lever 56 is turned.

On one lateral side of the cassette holder 19 facing to the distal end of the shutter opening and closing lever 56, there is turnably mounted a cassette thrust arm 61 formed of, for example, resilient synthetic resin. As shown in Fig. 2, the cassette thrust arm 61 has depending cassette thrust end pins 62, 62, a center journal 64 adapted to be passed by a supporting projection 63 implanted on the cassette holder 19, a lug 66 on one side thereof thrust by a thrust portion 65 formed on one side of the shutter opening and closing lever 56, and a depending thrust portion 67 on the other side thereof adapted for thrusting and supporting one side of the disk cassette 1.

The cassette thrust arm 61 has its center journal 64 journaled so that the thrust end pins 62, 62 will face to oblong through-holes 68, 68 formed in the cassette holder 19, the thrust portion 67 will face to a cut-out or window 69 on one lateral side of the cassette holder 19 and so that the supporting projection 63 will have a small clearance. When the cassette holder 19 is in the floated eject state,

the cassette thrust arm 61 thus mounted has its lug 66 thrust by the thrust portion 65 of the shutter opening and closing lever 56 as shown in Fig. 3 so that the thrust portion 67 is intruded into the inner portion of the cassette holder 19. Also, the cassette thrust arm 61 regulates the rotational position of the shutter opening and closing lever 56 since the arm 61 may be turned only within the extent of the through-holes 68, 68 confronted by the cassette thrust end pins 62, 62. When the shutter opening and closing lever 56 is in the state in which its rotation is regulated by the cassette thrust arm 61, the lever 56 is so positioned that the thrust pin 58 abuts on one side of the shutter 9 which is in the position of closing the disk cassette 1.

On the chassis 11, there are implanted positioning pins 69, 69 engaged in positioning pin engaging apertures 10, 10 in the disk cassette 1 chucked to the turntable 12 and positioning pins 70, 70 abutting on the surface of the disk cassette 1.

On the chassis 11, there is further provided a head unit 71 towards the rear side opposite to the side for inserting the disk cassette 1 provided with an insertion and removal opening 55 for the disk cassette 1. The head unit 71 is formed by a first supporting arm of a lower head arm 74 and a second supporting arm or an upper head arm 77. The first supporting arm is supported by having a through-hole thereof passed by a slide guide shaft 72 provided on the underside and along the radius of the magnetic disk 3 chucked on the disk table 14, and is fed along shaft 72 by a stepping motor 73. The second supporting arm 77 is mounted facing to and for rotation relative to the first supporting arm 74 and is provided at its distal end with a second magnetic head 76 facing to a first magnetic head 75 mounted to the foremost part of the supporting arm 74. The first supporting arm 74 is mounted by having a feed pin 80 engaging in a spiral feed groove 79 formed on a feed shaft 78 which is mounted parallel to the slide guide shaft 72 and which is coupled to the output shaft of the stepping motor 73. Upon rotation of feed shaft 78, the first supporting arm 74 is guided along the slide guide shaft 72 along with the second supporting arm 77 so as to be transported between the inner and outer peripheries of the magnetic disk 3 chucked onto the disk table 14.

The second supporting arm 77 is mounted with rotational bias towards the first supporting arm 74 by a spring 81 and with a rotational operating member 82 projecting on one side thereof and engaging with a cooperating rotational operating member 83 provided to the cassette holder 19. Thus the second supporting arm 77 is turned away from the first supporting arm 74 by the upward movement of the cassette holder 19 and turned

towards the first supporting arm 74 under the force of the spring 81 by the downward movement of the cassette holder 19. The second magnetic head 76 at the distal end of the second supporting arm 77 is brought into contact with the first magnetic head 75 with a predetermined pressure. When the magnetic disk 3 is mounted between these first and second magnetic heads, the second supporting arm 77 is biased by the spring 81 so that the second magnetic head 76 is abutted on the upper surface of the disk 3 with a predetermined pressure. Thus the first and second magnetic heads 75, 76 are kept in sliding contact with each other while holding the magnetic disk 3 therebetween.

In case the recording and/or reproducing apparatus making use of a disk cassette having a recording surface on only one surface thereof, a disk supporting pad formed for example of felt is provided on the second supporting arm 77 in place of the second magnetic head 76.

The operation of mounting or attaching the disk cassette 1 in the apparatus of the present invention will be explained.

When mounting the disk cassette 1, the loading plate 18 is thrust so that the respective guide rolls 22, 22; 50, 50 are positioned on the horizontal portions 28a, 28a; 30a, 30a of the inclined cams 28, 28; 30, 30 of the cam plates 32, 32; 34, 34, the cassette holder 19 being thereby floated as shown in Fig. 1 and 3. The disk cassette 1 is introduced from the side of the shutter 9 by way of the insertion and removal opening 55. As the disk cassette 1 is inserted as shown in Fig. 5, the thrust end pin 58 is engaged with the step 1a on one side of the shutter 9 to abut on the side of the shutter 9. As the disk cassette 1 is inserted further, the shutter opening and closing lever 56 is turned counterclockwise against the force of the spring 59 while its thrust pin 58 causes the shutter 9 to be slid to open the head insertion and removal opening 8. Meanwhile, the projection 47 of the locking lever 45 locking the loading plate 18 in the eject position is thrust by one end of the disk cassette 1 so that the lever 45 is turned counterclockwise in Fig. 5 against the force of the torsion coil spring 46. When the locking lever 45 is turned in this manner, the locking pin 42 becomes unlocked to abut on the foremost edge of the locking lever 45, the loading plate 18 being then slid by spring 38 forwards as shown by the arrow mark A in Fig. 3. When the loading plate 18 is slid forwards, the forward guide rolls 50, 50 and the rearward guide rolls 22, 22 of the cassette holder 19 are shifted to the inclined curvilinear portions 28b, 28b; 30b, 30b from the horizontal portions 28a, 28a; 30a, 30a of the inclined cam surfaces 28, 28; 30, 30 of the forward cam plates 32, 32 and the rearward cam plates 34, 34, as shown in Fig. 7. As the loading

plate 18 is slid further forwards, the cassette holder 19 is lowered and pressured onto the loading plate 18 by the compression springs 52, 52, as shown in Fig. 8. When the disk cassette 1 is introduced to a position overlying the disk table 14, the upper surface of the disk cassette 1 is thrust by the small projection 51, 51 and thrust end pins 62, 62 of the cassette thrust arm 61 for pressuring the disk cassette 1 onto the positioning pins 69, 69 and the supporting pins 70, 70. Thus the shutter opening and closing lever 56 is spaced away from the cassette thrust arm 61. Since the thrust arm 61 is supported with a certain clearance by the supporting pin 63, it is wobbled in its position as a function of the flexure of the disk cassette 1 to provide for a uniform pressure. At this time, the magnetic disk 3 within the disk cassette 1 is chucked with its center opening 5 engaged by the spindle shaft 13 and its center core 4 magnetically attracted by the permanent magnet 16 on the disk table 14 so that it can be rotated with the disk table 14.

Also, in association with the descent of the cassette holder 19 as described above, the second supporting arm 77 of the magnetic head unit 71 is turned towards the disk cassette 1 by spring 81 so that the second magnetic head 76 at the distal end thereof is intruded into the magnetic head insertion opening 8 for holding the magnetic disk 3 between it and the first magnetic head 75 at the distal end of the first supporting arm 74.

It is noted that, in the apparatus of the present invention, the rear cam plates 34, 34 towards the head unit 71 are at a higher level than the forward cam plates 32, 32 towards the insertion side for the disk cassette 1, while the radius of curvature R_1 of the inclined portions 30b, 30b of the inclined cam surfaces 30, 30 of the rear cam plates 34, 34 is selected to be larger than the radius of curvature R_2 of the inclined portions 28b, 28b of the inclined cam surfaces 28, 28 of the forward cam plates 32, 32. Therefore, when the cassette holder 19 is lowered, the side of the cassette holder towards the head unit 71 is lowered with a delay relative to that corresponding to the insertion of the disk cassette 1. The disk cassette 1 held by the cassette holder 19 is also lowered with a corresponding delay at the head unit 71. The result is that, after the magnetic disk 3 within the disk cassette 1 is chucked by the disk table 14, the second supporting arm 77 of the head unit 71 is turned towards the magnetic disk 3. In other words, it is after the chucking of the magnetic disk 3 is terminated that the disk is clamped between the first and second magnetic heads 75, 76.

When the magnetic disk 3 is chucked as described above and the magnetic disk 3 is clamped between the first and the second magnetic heads 75, 76, the rotational driving device 12 is driven

into operation. This causes the driving pin 15 to be engaged in the driving pin insertion opening 6 while causing the magnetic disk 3 to be positioned relative to the disk table 14 and turned in unison therewith. On the other hand, the first and the second magnetic heads 75, 76 are brought into sliding contact with the magnetic disk 3 with a predetermined pressure to enable information signals to be written or read to or from the disk.

After the writing or reading of the information signals to or from the magnetic disk 3 is terminated, the disk cassette in the attached state as shown in Fig. 5 and 8 can be ejected by actuating the eject button 39 so as to slide the loading plate 18 inwards against the urging of the spring 38. In this case, by the reverse of the operation performed at the time of attachment of the disk cassette 1, the guide rolls 22, 22; 50, 50 of the cassette holder 19 slide on the inclined cam surfaces 28, 28; 30, 30 of the cam plates 32, 32; 34, 34 to be thereby floated, as shown in Fig. 7. The cassette holder 19 is shifted upward away from the loading plate 18 against the urging of the compression spring 52, 52 for pressure holding of the disk cassette 1, while turning the second supporting arm 77 of the head unit 71 upwards and away from the surface of the magnetic disk 3. Meanwhile, when the loading plate 18 is slid inward as described above, the locking pin 42 is engaged with the locking lever 45 for locking the plate 18 at the inner position against the urging force of the spring 38. On the other hand, when the cassette holder 19 is raised to release the pressure holding of the disk cassette 1, the shutter opening and closing lever 56 is turned clockwise by the spring 59 to thrust the disk cassette 1 towards the insertion and removal opening 55. Simultaneously, the thrust portion 65 thrusts the lug 66 of the cassette thrust arm 61 for turning the latter clockwise in Fig. 5. When the cassette thrust arm 61 is turned clockwise in this manner, the depending thrust portion 67 intrudes into the inside of the cassette holder 19 through the cut-out or window 69 thereof to thrust the mid portion of the one lateral side of the disk cassette 1 that is being thrust by the lever 56 and that is about to be moved out of the cassette holder. This causes the movement of the disk cassette to be halted. The result is that the disk cassette 1 is supported in the state in which a portion of the disk cassette 1 is protruded out of the insertion and removal opening 55 to permit the disk cassette 1 to be grasped manually to inhibit complete extrication thereof.

During the ejection of the disk cassette 1, the cassette holder 19 is floated at the side thereof towards the head unit 71 first by the sequence of operations which is the reverse of that at the time of attachment of the disk cassette 1. Thus it is after

the second supporting arm 77 of the head unit 71 is shifted away from the surface of the magnetic disk 3 that the magnetic disk 3 is unchucked from the disk table 14.

In the above described embodiment, the height of the rear cam plates 34, 34 is set so as to be at a higher level than that of the forward cam plates 32, 32, such that the cassette holder 19 is lowered with a relative delay at the side towards the head unit 71. However, when the cam plates 32, 32; 34, 34 are of the same height but the diameter of the guide rolls 22, 22 resting on the rear cam plates 34, 34 is set so as to be larger than that of the guide rolls 50, 50 resting on the forward cam plates 32, 32, as shown in Fig. 11, it is possible to cause the cassette holder 19 to be lowered with a relative delay at the side thereof towards the head unit 71.

As an alternative, when the height of the cam plates 32, 32 is equal to that of the cam plates 34, 34 and the diameter of the guide rolls 22, 22 is also equal to that of the guide rolls 50, 50, but the rear guide rolls 22, 22 are mounted at a lower level than the forward guide rolls 50, 50, it is likewise possible to cause the cassette holder 19 to be lowered with a relative delay at the side thereof towards the head unit 71.

As a further alternative, when the length of the inclined cam surfaces 30, 30 of the rear cam plates 34, 34 is set so as to be longer than that of the inclined cam surfaces 28, 28 of the forward cam plates 32, 32, it becomes likewise possible to cause the cassette holder 19 to be lowered with a relative delay at the side thereof towards the head unit 71.

Claims

1. A recording an/or reproducing apparatus for a flexible magnetic disk (3) wherein a disk cassette (1) rotatably accommodating a magnetic disk is chucked for recording or reproducing information signals on or from the disk, said apparatus comprising :

a holder (19) into which the disk cassette (1) is inserted from one end thereof and which is adapted to hold the disk cassette;

rotational driving means (12) for chucking and rotationally driving the magnetic disk on a turntable (14);

raising and lowering means (32, 34) for raising and lowering said holder for raising and lowering the magnetic disk relative to said turntable;

a lower head arm (74) disposed at the other end of said holder and adapted to be radially moved relative to the magnetic disk chucked on said turntable, said lower head arm carrying at the distal end thereof a lower

into operation. This causes the driving pin 15 to be engaged in the driving pin insertion opening 6 while causing the magnetic disk 3 to be positioned relative to the disk table 14 and turned in unison therewith. On the other hand, the first and the second magnetic heads 75, 76 are brought into sliding contact with the magnetic disk 3 with a predetermined pressure to enable information signals to be written or read to or from the disk.

After the writing or reading of the information signals to or from the magnetic disk 3 is terminated, the disk cassette in the attached state as shown in Fig. 5 and 8 can be ejected by actuating the eject button 39 so as to slide the loading plate 18 inwards against the urging of the spring 38. In this case, by the reverse of the operation performed at the time of attachment of the disk cassette 1, the guide rolls 22, 22; 50, 50 of the cassette holder 19 slide on the inclined cam surfaces 28, 28; 30, 30 of the cam plates 32, 32; 34, 34 to be thereby floated, as shown in Fig. 7. The cassette holder 19 is shifted upward away from the loading plate 18 against the urging of the compression spring 52, 52 for pressure holding of the disk cassette 1, while turning the second supporting arm 77 of the head unit 71 upwards and away from the surface of the magnetic disk 3. Meanwhile, when the loading plate 18 is slid inward as described above, the locking pin 42 is engaged with the locking lever 45 for locking the plate 18 at the inner position against the urging force of the spring 38. On the other hand, when the cassette holder 19 is raised to release the pressure holding of the disk cassette 1, the shutter opening and closing lever 56 is turned clockwise by the spring 59 to thrust the disk cassette 1 towards the insertion and removal opening 55. Simultaneously, the thrust portion 65 thrusts the lug 66 of the cassette thrust arm 61 for turning the latter clockwise in Fig. 5. When the cassette thrust arm 61 is turned clockwise in this manner, the depending thrust portion 67 intrudes into the inside of the cassette holder 19 through the cut-out or window 69 thereof to thrust the mid portion of the one lateral side of the disk cassette 1 that is being thrust by the lever 56 and that is about to be moved out of the cassette holder. This causes the movement of the disk cassette to be halted. The result is that the disk cassette 1 is supported in the state in which a portion of the disk cassette 1 is protruded out of the insertion and removal opening 55 to permit the disk cassette 1 to be grasped manually to inhibit complete extrication thereof.

During the ejection of the disk cassette 1, the cassette holder 19 is floated at the side thereof towards the head unit 71 first by the sequence of operations which is the reverse of that at the time of attachment of the disk cassette 1. Thus it is after

the second supporting arm 77 of the head unit 71 is shifted away from the surface of the magnetic disk 3 that the magnetic disk 3 is unchucked from the disk table 14.

In the above described embodiment, the height of the rear cam plates 34, 34 is set so as to be at a higher level than that of the forward cam plates 32, 32, such that the cassette holder 19 is lowered with a relative delay at the side towards the head unit 71. However, when the cam plates 32, 32; 34, 34 are of the same height but the diameter of the guide rolls 22, 22 resting on the rear cam plates 34, 34 is set so as to be larger than that of the guide rolls 50, 50 resting on the forward cam plates 32, 32, as shown in Fig. 11, it is possible to cause the cassette holder 19 to be lowered with a relative delay at the side thereof towards the head unit 71.

As an alternative, when the height of the cam plates 32, 32 is equal to that of the cam plates 34, 34 and the diameter of the guide rolls 22, 22 is also equal to that of the guide rolls 50, 50, but the rear guide rolls 22, 22 are mounted at a lower level than the forward guide rolls 50, 50, it is likewise possible to cause the cassette holder 19 to be lowered with a relative delay at the side thereof towards the head unit 71.

As a further alternative, when the length of the inclined cam surfaces 30, 30 of the rear cam plates 34, 34 is set so as to be longer than that of the inclined cam surfaces 28, 28 of the forward cam plates 32, 32, it becomes likewise possible to cause the cassette holder 19 to be lowered with a relative delay at the side thereof towards the head unit 71.

Claims

1. A recording an/or reproducing apparatus for a flexible magnetic disk (3) wherein a disk cassette (1) rotatably accommodating a magnetic disk is chucked for recording or reproducing information signals on or from the disk, said apparatus comprising :

a holder (19) into which the disk cassette (1) is inserted from one end thereof and which is adapted to hold the disk cassette;

rotational driving means (12) for chucking and rotationally driving the magnetic disk on a turntable (14);

raising and lowering means (32, 34) for raising and lowering said holder for raising and lowering the magnetic disk relative to said turntable;

a lower head arm (74) disposed at the other end of said holder and adapted to be radially moved relative to the magnetic disk chucked on said turntable, said lower head arm carrying at the distal end thereof a lower



head (75) slidably contacted with the lower surface of the magnetic disk (3); and

an upper head arm (77) arranged in opposition to said lower head arm and carrying at the distal end thereof an upper head (76) which is lowered with the lowering of said holder so as to be brought into contact with the upper surface of the magnetic disk, characterized in that said raising and lowering means (32, 34) causes said holder (19) to be lowered such that the other end of said holder is lowered with a delay relative to the one end thereof so that after the magnetic disk is chucked on said turntable (14) the upper head arm (77) arranged toward the other end of said holder is lowered so that the upper head (76) is slidably contacted with the upper surface of the magnetic disk.

2. A recording and/or reproducing apparatus according to claim 1 wherein said holder (19) has a pair of projections (49,50) at one end and another pair of projections (21,22) on the other end of each of the lateral sides thereof, said raising and lowering means includes a sliding plate (18) adapted for supporting said projections and having plural supporting portions (32,34) including inclined surfaces (28,30), said projections sliding down along said inclined surfaces to lower said holder.
3. A recording and/or reproducing apparatus according to claim 2, wherein the supporting portions (34) at said other ends are at a higher level than those at said one ends so that the holder (19) is lowered with a relative delay at said other ends as compared to said one ends.
4. A recording and/or reproducing apparatus according to claim 2 wherein the radius (R_1) of the cam surface (30b) forming the inclined surface of the supporting portions (34) at the other ends is selected to be larger than that (R_2) of the cam surfaces (28b) forming the inclined surfaces of the supporting portions (32) at the one ends so that the holder (19) is lowered with a relative delay at the other ends as compared to said one ends.
5. A recording and/or reproducing apparatus according to claim 2 wherein said projections are formed by cylinders (22,50) extending out of the lateral sides of said holder, and wherein the diameter of each of the projections (22) provided to the other end of said holder is selected to be larger than that of each of the projections (50) provided to the one end thereof so that the holder (19) is lowered with a

relative delay at the other ends as compared to said one ends.

6. A recording and/or reproducing apparatus according to claim 2 wherein said projections are formed by rolls (22,50) sliding on said supporting portions (34,32).

Revendications

1. Appareil d'enregistrement et, ou bien, de reproduction pour disque souple magnétique (3), où une cassette de disque (1) logeant de manière qu'il puisse tourner un disque magnétique est montée en position centrée pour permettre d'enregistrer ou de reproduire des signaux d'information sur le disque, ledit appareil comprenant :

un support, (19) dans lequel la cassette de disque (1) est insérée par une première de ses extrémités et qui est destiné à porter la cassette de disque ;

un moyen d'entraînement en rotation (12) servant à monter en position centrée et à entraîner en rotation le disque magnétique sur une platine de disque (14) ;

un moyen d'élévation et d'abaissement (32, 34) servant à élever et abaisser ledit support afin d'élever et d'abaisser le disque magnétique par rapport à ladite platine ;

un bras de tête inférieure (74) disposé à l'autre extrémité dudit support et conçu pour être déplacé radialement par rapport au disque magnétique monté en position centrée sur ladite platine, ledit bras de tête inférieure portant à son extrémité distale une tête inférieure (75) en contact glissant avec la surface inférieure du disque magnétique (3) ; et

un bras de tête supérieure (77) dispose en opposition avec ledit bras de tête inférieure et portant à son extrémité distale une tête supérieure (76) qui s'abaisse lorsque ledit support s'abaisse de façon à être mise en contact avec la surface supérieure du disque magnétique, caractérisé en ce que ledit moyen d'élévation et d'abaissement (32, 34) fait que ledit support (19) s'abaisse de façon que l'autre extrémité dudit support s'abaisse avec un certain retard par rapport à sa première extrémité de sorte que, après que le disque magnétique a été monté en position centrée sur ladite platine (14), le bras de tête supérieure (77) disposé vers l'autre extrémité dudit support s'abaisse de manière que la tête supérieure (76) soit en contact glissant avec la surface supérieure du disque magnétique.



2. Appareil d'enregistrement et, ou bien, de reproduction selon la revendication 1, ou ledit support (19) possède une paire de parties saillantes (49, 50) à une première extrémité et une autre paire de parties saillantes (21, 22) à l'autre extrémité de chacun de ses côtés latéraux, ledit moyen d'élévation et d'abaissement comporte un plateau coulissant (18) conçu pour porter lesdites parties saillantes et possédant plusieurs parties de support (32, 34) contenant des surfaces inclinées (28, 30), lesdites parties saillantes descendant en glissant le long desdites surfaces inclinées de façon à abaisser ledit support.
3. Appareil d'enregistrement et, ou bien, de reproduction selon la revendication 2, où les parties de support (34) se trouvant auxdites autres extrémités sont à un niveau plus élevé que celles se trouvant auxdites premières extrémités si bien que le support (19) s'abaisse avec un certain retard relatif, au niveau desdites autres extrémités, par comparaison avec lesdites premières extrémités.
4. Appareil d'enregistrement et, ou bien, de reproduction selon la revendication 2, où le rayon (R_1) de la surface de came (30b) formant la surface inclinée des parties de support (34) se trouvant aux autres extrémités est choisi de façon à être plus grand que celui (R_2) des surfaces de came (28b) formant les surfaces inclinées des parties de support (32) se trouvant aux premières extrémités, de sorte que le support (19) s'abaisse avec un certain retard relatif, au niveau des autres extrémités, par comparaison avec lesdites premières extrémités.
5. Appareil d'enregistrement et, ou bien, de reproduction selon la revendication 2, où lesdites parties saillantes sont formées par des cylindres (22, 50) faisant saillie au-delà des côtés latéraux dudit support, et où le diamètre de chacune des parties saillantes (22) situées à l'autre extrémité dudit support est choisi de façon à être plus grand que celui de chacune des parties saillantes (50) se trouvant à sa première extrémité, de sorte que le support (19) s'abaisse avec un certain retard relatif, au niveau des autres extrémités, par comparaison avec lesdites premières extrémités.
6. Appareil d'enregistrement et, ou bien, de reproduction selon la revendication 2, où lesdites parties saillantes sont formées par des galets (22, 50) glissant sur lesdites parties de support (34, 32).

Patentansprüche

1. Aufnahme- und/oder Wiedergabegerät für eine biegsame Magnetplatte (3), wobei eine Plattenkassette (1), in der eine Magnetplatte drehbar aufgenommen wird, eingespannt wird, um Informationssignale auf der Platte aufzuzeichnen oder davon wiederzugeben, wobei das Gerät enthält:
 - eine Halterung (19), in die die Plattenkassette (1) vom einen Ende eingesetzt wird, wobei die Halterung (19) so aufgebaut ist, um die Plattenkassette zu halten;
 - einen Drehantrieb (12), um die Magnetplatte auf einem Plattenteller (14) einzuspannen und in Drehung zu versetzen;
 - eine Anheb/Absenk-Einrichtung (32, 34), um die Halterung anzuheben und abzusenken, um die Magnetplatte relativ zum Plattenteller anzuheben und abzusenken;
 - einen unteren Kopfarm (74), der am anderen Ende der Halterung angeordnet ist und dazu dient, um radial relativ zur Magnetplatte bewegt zu werden, die am Plattenteller eingespannt ist, wobei der untere Kopfarm an seinem freien Ende einen unteren Kopf (75) trägt, der mit der unteren Fläche der Magnetplatte (3) gleitend in Berührung steht; und
 - einen oberen Kopfarm (77), der gegenüber dem unteren Kopfarm angeordnet ist und an seinem freien Ende einen oberen Kopf (76) trägt, der mit dem Absenken der Halterung so abgesenkt wird, daß er mit der oberen Fläche der Magnetplatte in Berührung gebracht wird; dadurch gekennzeichnet, daß die Anheb/Absenk-Einrichtung (32, 34) veranlaßt, daß die Halterung (19) so abgesenkt wird, daß das andere Ende der Halterung mit einer Verzögerung relativ zum einen Ende abgesenkt wird, so daß nach dem Einspannen der Magnetplatte auf dem Plattenteller (14) der obere Kopfarm (77), der zum anderen Ende der Halterung angeordnet ist, so abgesenkt wird, daß der obere Kopf (76) mit der oberen Fläche der Magnetplatte gleitend in Berührung tritt.
2. Aufnahme- und/oder Wiedergabegerät gemäß Anspruch 1, wobei die Halterung (19) ein Paar von Vorsprüngen (49, 50) an einem Ende sowie ein anderes Paar von Vorsprüngen (21, 22) am anderen Ende von jeder Seite besitzt, wobei die Anheb/Absenk-Einrichtung eine Gleitplatte (18) aufweist, die dazu dient, um die Vorsprünge zu halten, wobei sie eine Vielzahl von Tragteilen (32, 34) einschließlich schräger Flächen (28, 30) besitzt, wobei die Vorsprünge entlang der schrägen Flächen nach unten gleiten, um die Halterung abzusenken.



Aufnahme- und/oder Wiedergabegerät gemäß Anspruch 2, wobei die Tragteile (34) an den anderen Enden auf einem höheren Niveau als jene an den einen Enden liegen, so daß die Halterung (19) mit einer relativen Verzögerung an den anderen Enden im Vergleich zu den einen Enden abgesenkt wird.

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4. Aufnahme- und/oder Wiedergabegerät gemäß Anspruch 2, wobei der Radius (R_1) der Nockenfläche (30b), die die schräge Fläche der Tragteile (34) an den anderen Enden bildet, so gewählt wird, daß er größer als der Radius (R_2) der Nockenflächen (28b) ist, die die schrägen Flächen der Tragteile (32) an den einen Enden bilden, so daß die Halterung (19) mit einer relativen Verzögerung an den anderen Enden im Vergleich zu den einen Enden abgesenkt wird.

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5. Aufnahme- und/oder Wiedergabegerät gemäß Anspruch 2, wobei die Vorsprünge von Zylindern (22, 50) gebildet werden, die aus den Seiten der Halterung verlaufen, und wobei der Durchmesser eines jeden Vorsprungs (22) der am anderen Ende der Halterung vorgesehen ist, so gewählt wird, daß er größer als der Durchmesser eines jeden Vorsprungs (50) ist, der am einen Ende davon vorgesehen ist, so daß die Halterung (19) mit einer relativen Verzögerung an den anderen Enden im Vergleich zu den einen Enden abgesenkt wird.

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6. Aufnahme- und/oder Wiedergabegerät gemäß Anspruch 2, wobei die Vorsprünge von Rollen (22, 50) gebildet werden, die auf den Tragteilen (34, 32) gleiten.

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